

Descriptive Summary of the Changes in Coastal North Carolina, February 4, 1991, to January 12, 1997

Forested lands dominated the landscape of coastal North Carolina with more than 2.4 million acres (approximately 23 percent of the land) covered by evergreen, mixed, deciduous, and wetland forests. At over 530,000 acres, forestry transitions constituted the greatest change detected by the C-CAP land cover analysis in North Carolina. These transitions represented a cyclic silviculture process, which involves the harvest and reforestation of evergreen tree stands. Evergreen farming is a monoculture farming practice common to the Southeast region of the United States. This process was clearly illustrated by the initial change of evergreen forest to bare land following the clearing of a forest, after which grasses colonized the area, transforming the land cover to grassland. Finally, after the reforestation of seedlings, this grassland started to develop into scrub/shrub, eventually reverting to mature evergreen forest. This was evidenced in the data set with over 35,000 acres of evergreen forest transforming to bare land, 182,000 acres of evergreen forest converting to grassland, and 52,000 acres of grassland and 81,000 acres of scrub/shrub reverting to mature evergreen forest.

When forests are converted to low intensity development, such as residential neighborhoods, the impact to the affected forests may be less because, typically, 20 to 50 percent of the vegetative cover remains in residential neighborhoods through the incorporation of large yards, parks, trees, and open spaces. High intensity development, such as industrial parks, parking lots, and highways, impacts once-forested areas severely because the area is no longer predominated by vegetation; rather the landscape is dominated with buildings and paved surfaces. Specifically, coastal development occurred in the region from Raleigh to Wilmington in the Cape Fear River drainage basin in the early 1990s with the construction of the Interstate 40 (I-40) highway. This resulted in the concentrated growth of high and low intensity developed areas along the I-40 exchange. About 23,000 acres of combined forest, scrub/shrub, and grasslands were lost to development during the period from 1991 to 1997.

Historically, eastern portions of the study area, with wetland cover types, had been heavily trenched and managed for agricultural processes. C-CAP data illustrated that many of these cultivated areas were reverting to wetland land cover types. Though the trenches are still evident, there has been a rejuvenation of wetland species within the approximately 75,000 acres of various land covers that have converted back to wetland land covers.

During the time span of the analysis, four hurricanes made landfall in the southern portion of North Carolina. Hurricanes alter the landscape through storm surges and high-speed winds, which push salt water landward, deposit sand and shell along the coast and in the salt marsh, wash out areas of higher ground, defoliate forests, and destroy wetlands. The impacts of hurricanes transformed the Carolina coast in several ways. First, the destruction of wetlands resulted in both the movement of wetlands and the gradual transition to other wetland classes as affected areas recovered. Second, the coastline of North Carolina changed in many places due to erosion and accretion

processes attributed to storm surges. Finally, the defoliation of trees resulted in many full canopy forests being initially identified as scrub/shrub areas before recovery and, through regrowth, as full canopy closure several years later.

Below are three tables. The first two tables contain a data summary for the time 1 and time 2 images. These images were used to create the change image and their tables include; land cover classes, the number of pixels present in each class, and their corresponding values in acres.

The third table is a complete change matrix for time 1 and time 2 images and includes a smaller, generalized table, which groups similar classes together. Table three compares each class from time 1 to time 2 and illustrates the change that took place between classes. The table presents the total acres for each class, the total percent that each class represents, the total acres that changed, and the percent of change they represent.

Tabular Summary: North Carolina, February 4, 1991

	CLASS	PIXELS	ACRES	PERCENT
0	Background	0	0	0.00%
1	Unclassified	0	0	0.00%
2	High Intensity Developed	276148	61414	0.31%
3	Low Intensity Developed	865220	192420	0.97%
4	Cultivated Land	9988427	2221366	11.21%
5	Grassland	5602240	1245904	6.29%
6	Deciduous Forest	359010	79842	0.40%
7	Evergreen Forest	10021805	2228789	11.25%
8	Mixed Forest	1859545	413552	2.09%
9	Scrub/Shrub	5918000	1316127	6.64%
10	Palustrine Forested Wetland	9422810	2095576	10.58%
11	Palustrine Scrub/Shrub Wetland	2208930	491253	2.48%
12	Palustrine Emergent Wetland	129583	28818	0.15%
13	Estuarine Forested Wetland	0	0	0.00%
14	Estuarine Scrub/Shrub Wetland	0	0	0.00%
15	Estuarine Emergent Wetland	958343	213130	1.08%
16	Unconsolidated Shore	52851	11754	0.06%
17	Bare Land	570106	126788	0.64%
18	Water	40849065	9084584	45.86%
19	Palustrine Aquatic Bed	0	0	0.00%
20	Estuarine Aquatic bed	0	0	0.00%
21	Tundra	0	0	0.00%
22	Snow/Ice	0	0	0.00%
	TOTALS	89082083	19811315	100.00%

Tabular Summary: North Carolina, January 12, 1997

	CLASS	PIXELS	ACRES	PERCENT
0	Background	0	0	0.00%
1	Unclassified	0	0	0.00%
2	High Intensity Developed	285640	63525	0.32%
3	Low Intensity Developed	967787	215230	1.09%
4	Cultivated Land	9955460	2214034	11.18%
5	Grassland	5359108	1191833	6.02%
6	Deciduous Forest	385060	85635	0.43%
7	Evergreen Forest	8521453	1895119	9.57%
8	Mixed Forest	1891772	420719	2.12%
9	Scrub/Shrub	7459534	1658955	8.37%
10	Palustrine Forested Wetland	9194364	2044771	10.32%
11	Palustrine Scrub/Shrub Wetland	2384175	530226	2.68%
12	Palustrine Emergent Wetland	103204	22952	0.12%
13	Estuarine Forested Wetland	0	0	0.00%
14	Estuarine Scrub/Shrub Wetland	0	0	0.00%
15	Estuarine Emergent Wetland	959721	213436	1.08%
16	Unconsolidated Shore	47556	10576	0.05%
17	Bare Land	662230	147276	0.74%
18	Water	40905019	9097028	45.92%
19	Palustrine Aquatic Bed	0	0	0.00%
20	Estuarine Aquatic Bed	0	0	0.00%
21	Tundra	0	0	0.00%
22	Snow/Ice	0	0	0.00%
	TOTALS	89082083	19811315	100.00%

Change Matrix and Tabular Summary: North Carolina, from February 4, 1991 to January 12, 1997

	FROM / TO	High Intensity Developed	Low Intensity Developed	Cultivated Land	Grassland	Deciduous Forest	Evergreen Forest	Mixed Forest	Scrub/Shrub	Palustrine Forested Wetland	Palustrine Scrub/Shrub Wetland	Palustrine Emergent Wetland	Estuarine Forested Wetland	Estuarine Scrub/Shrub Wetland	Estuarine Emergent Wetland	Unconsolidated Shore	Bare Land	Water	Palustrine Aquatic Bed	Estuarine Aquatic Bed	Tundra	Snow/ice	Total Acres	Changed	
2	High Intensity Developed	81419		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	61,414	0	High Intensity Developed
3	Low Intensity Developed		192,406	0	1	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	192,420	14	Low Intensity Developed
4	Cultivated Land	134	423	2,198,070	128,32	224	1,755	768	4,195	864	540	777	0	0	0	0	16	874	589	0	0	0	2,221,366	23,296	Cultivated Land
5	Grassland	463	3,176	6,065	938,992		5,535	5,064	17,864	191,191	14,169	8,727	0	0	0	613	251	5411	4616	0	0	0	1,445,965	310,878	Grassland
6	Deciduous Forest	0	0	0	14	78,005		0	16	0	0	0	0	0	0	0	0	1	0	0	0	0	79,442	32	Deciduous Forest
7	Evergreen Forest	940	14,700	5,189	162,462	0	1,757,330	6,078	206,345	1	17,224	10,119	0	0	0	910	38	350,003	15,661	0	0	0	2,228,792	471,462	Evergreen Forest
8	Mixed Forest	2	287	450	113,095	0	39,442	2,025	4	0	0	0	0	0	0	0	0	739	3	0	0	0	413,551	15,129	Mixed Forest
9	Scrub/Shrub	213	2073	2665	145,927	731	81,205	1845	1,206,440	2	852	103	0	0	28	22	4183	209	0	0	0	0	1,316,130	109,690	Scrub/Shrub
10	Palustrine Forested Wetland	40	417	463	28531	1	12	22,032	180,720	60,516	447	0	0	0	302	21	3922	1633	0	0	0	0	2,095,572	95,342	Palustrine Forested Wetland
11	Palustrine Scrub/Shrub Wetland	1	16	106	19	1074	57	17	3,251	486,606	64	0	0	0	0	4	769	298	0	0	0	0	497,233	34,647	Palustrine Scrub/Shrub Wetland
12	Palustrine Emergent Wetland	6	36	181	3130	324	843	636	2,094	196	422	20,097	0	0	0	12	87	485	0	0	0	0	28,819	8,451	Palustrine Emergent Wetland
13	Estuarine Forested Wetland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Estuarine Forested Wetland
14	Estuarine Scrub/Shrub Wetland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Estuarine Scrub/Shrub Wetland
15	Estuarine Emergent Wetland	22	54	0	0	0	0	0	0	0	141	0	0	0	211,548	250	48	1069	0	0	0	0	213,129	1,681	Estuarine Emergent Wetland
16	Unconsolidated Shore	1	70	0	0	0	0	0	0	0	2	0	0	13	9378	515	1583	0	0	0	0	0	11,754	2,275	Unconsolidated Shore
17	Bare Land	247	730	824	3076	9	163	28	19,564	36	5126	11	0	0	9	333	95812	1020	0	0	0	0	126,788	31,176	Bare Land
18	Water	15	13	21	77	2	11	4	54	13	21	28	0	0	17	257	134	9083960	0	0	0	0	9,094,585	865	Water
19	Palustrine Aquatic Bed	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Palustrine Aquatic Bed
20	Estuarine Aquatic Bed	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Estuarine Aquatic Bed
21	Tundra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Tundra
22	Snow/ice	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Snow/ice
Total Acres		63,625	215,230	2,214,034	1,191,834	88,635	1,896,122	426,718	1,688,989	2,044,767	630,226	22,952	0	0	215,436	10,676	147,276	9,097,029	0	0	0	0	16,727,399		Total Acres
Percent of Total		0.38%	1.28%	13.30%	7.15%	0.53%	11.35%	2.54%	10.10%	12.30%	3.76%	0.14%	0.00%	0.00%	1.28%	0.06%	0.88%	54.40%	0.00%	0.00%	0.00%	0.00%			Percent of Total
Total Acres that Changed (Y2-Y1)		2,111	22,816	-7,332	-54,971	5,793	-333,676	7,167	342,828	-50,805	38,973	-5,867	0	0	308	-1,178	20,488	12,444	0	0	0	0	1,110,442		Total Acres that Changed
Percent Change		3.44%	11.85%	-0.33%	-4.54%	7.26%	-14.97%	1.73%	20.65%	-2.42%	7.93%	-26.36%	0	0	0.14%	-10.62%	16.16%	0.14%	0	0	0	0	10.35%		Percent Change

FROM / TO	Developed	Cultivated	Grassland	Forested	Scrub/Shrub	Wetlands	Bare	Water	Total Acres	Changed	Developed
Developed	253,827	0	1	4	0	0	0	1	253,833	6	Developed
Cultivated	562	2,198,070	12,632	3,611	4,734	1,450	895	589	2,222,770	24,790	Cultivated
Grassland	3,059	6,065	938,327	89,222	199,018	24,321	5,061	4,616	1,268,791	333,464	Grassland
Forested	16,380	6,101	222,592	4,233,902	293,193	19,205	39,720	3,192	4,834,290	609,387	Forested
Scrub/Shrub	3,203	2,772	14,547	117,239	1,063,018	32,456	4,057	557	1,639,646	175,730	Scrub/Shrub
Wetlands	692	750	31,081	2,854	24,143	2,760,086	5,111	3,443	2,828,772	69,674	Wetlands
Bare	978	824	3,327	236	24,662	5,205	105,835	2,602	143,704	37,869	Bare
Water	0	21	3,076	26	76	76	361	8,088,921	9,097,619	4,699	Water
Total Acres	279,229	2,214,663	1,223,363	4,447,198	2,210,671	2,842,863	162,567	8,088,921	16,727,399	1,244,530	Total Acres
Percent of Total (Y2/Y1)	2.60%	20.64%	11.40%	41.46%	26.61%	26.60%	1.62%	84.82%		11.60%	
Total Change (Y2-Y1)	23,386	-4,167	-45,408	-387,392	371,026	14,081	18,863	11,302		1,244,530	
Percent Change	10.01%	-0.37%	-3.88%	-8.61%	20.17%	0.60%	13.13%	0.12%		11.60%	